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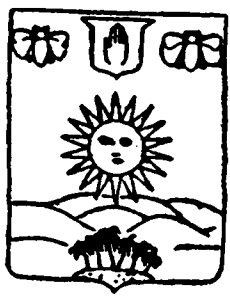
PREHISTORY IN INDIA

By

F. E. ZEUNER



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PREHISTORY IN INDIA

Four Broadcast Talks on Early Man

Deccan College Handbook Series: 1

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FOUR BROADCAST TALKS ON EARLY MAN

By

FREDERICK E. ZEUNER
D.Sc., Ph.D., F.G.S., F.Z.S.

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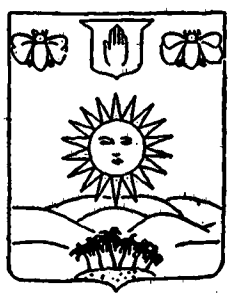

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F. E. ZEUNER

ASIATIC SOCIETY OF BOMBAY
Presented by -
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Date 6.2.71

DECCAN COLLEGE
Postgraduate and Research Institute
POONA

PREHISTORY IN INDIA

FOUR BROADCAST TALKS
ON EARLY MAN

By

FREDERICK E. ZEUNER
D.Sc., Ph.D., F.G.S., F.Z.S.

Professor of Environmental Archaeology,
Institute of Archaeology, University of London.

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1951

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INTRODUCTORY NOTE

In the early part of 1949, the Government of India, through its Department of Archaeology in New Delhi, and the Deccan College Postgraduate Research Institute, Poona, (with the aid of the Wadia and Tata Trusts) jointly organized an expedition in order to explore the possibilities of developing research in the prehistory of India. Scientifically, the expedition was intended to cover the twin fields of prehistory proper *i.e.*, the science of man prior to the beginnings of the historic period, and of geochronology, *i.e.*, that branch of geology which among other problems concerns itself with the climatic fluctuations and the dating of the more recent geological past. In practice, the expedition was intended both to carry out exploration and research, and at the same time to acquaint Indian scholars with modern methods of research and to train them in the field. The practical work was supplemented by numerous lectures, among which may be counted the four broadcast talks reproduced in this booklet. These were intended for the wide audience of those who are interested in the intellectual progress of India.

In presenting these talks in printed form, I am complying with many requests of friends who thought that their publication might help the cause of archaeology in general. Inevitably, the liveliness of the spoken word is lost but, to make up for it, the booklet has been enlivened visually by the addition of sixteen carefully selected illustrations which should give the reader unacquainted with the subject some idea of what the talks are about.

It might be worth while to reiterate that the talks were not prepared for the benefit of the expert. Hence they are very elementary in the treatment both of prehistory and geochronology. The original text of the broadcasts has been retained except for a few verbal improvements and some statements which, for the press, required more accurate formulation.

I wish to take this opportunity to express my thanks to all the members of the staff of our expedition whose never failing

comradeship was a source of real joy. In the short time of four months a great amount of work was done which would not have been possible without their unceasing willingness to work without break from dawn into the night, day after day. If the expedition has produced any scientific results, it is largely due to their co-operation.

I further wish to record my gratitude to Dr. S. M. KATRE, Director of the Deccan College Postgraduate and Research Institute, Poona for his part in the publication of this booklet, and also to the following gentlemen who very kindly supplied or gave permission to use certain illustrations: Dr. A. AIYAPPAN, Superintendent of the Government Museum, Madras; Dr. C VON FURER HAIMENDORF, Reader in Anthropology, University of London; Mr. V. D. KRISHNASWAMI, Superintendent of Archaeology, Southern Circle, Madras; Dr. R. NEUVILE, Consul Général de France, Jerusalem, Palestine; Dr. H. D. SANKALIA, Professor of Proto-and Ancient History, Deccan College Research Institute, Poona; Dr. B. SUBBARAO, Baroda University and Professor R. E. M. WHEELER, University of London and late Director General of Archaeology in India.

Finally acknowledgments are due to the managers of All-India Radio for their kind permission to reproduce the talks.

F. E. ZEUNER.

14th September, 1950.

Department of Environmental Archaeology
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I. ARCHAEOLOGY—PREHISTORY—GEOLOGY

Since early times, human thought has been concerned with problems which are not directly concerned with man's survival. It is one of the characteristics which raises man above the level of the animal that he is trying to find an answer to the problem of his own existence, to search for a purpose in life and to discover forces beyond the purely physical that might influence his activities. In this way philosophy and religion came into existence.

Into the consideration of any problem of this kind, TIME enters as an essential feature. There is a present, there is also a past, and a future. Even in the Stone Age, more than a hundred thousand years ago, man had already become aware of this, for burials have been found of the extinct Neanderthal race of man equipped with implements and food for the future life of the deceased person. It seems probable to me, that primitive man was concerned with his future rather than his past, as fore-knowledge would have helped him in his struggle for existence.

It requires a higher plane of thought to be interested in the past of one's own race, or of mankind in general. The question of how things came to be what they are arises naturally through our pre-occupation with problems of the future, because what happened in the past might well give us clues to future developments.

It is not surprising, therefore, that all the more highly developed civilizations possess stories of the past evolution of the race concerned, stories which are either passed on by mouth from generation to generation, or are embodied in sacred books and epics.

But it was only at a comparatively late stage, within the last two hundred years, that it occurred to man to study the remains of the activities of his ancestors in order to obtain more precise information about what happened in the past.

This approach to the problem is a scientific one, and the science that tackles it is called ARCHAEOLOGY.

The most obvious objects to be studied are of course the most conspicuous and least perishable ones: buildings. India is exceedingly rich in monuments of her past, many of the greatest beauty. No wonder, therefore, that archaeological research in this country has concentrated on such kind of relics of the past, and much valuable work has been done. Many of the great monuments have been restored and preserved and are under the care of the Department of Archaeology, and the Exhibition of Indian Art which was held at New Delhi in 1948 testifies to the achievements of many centuries of India's glorious past.

Now, so far as this branch of archaeology is concerned, the question of how old the monuments and objects are, is usually settled by historical methods. By this we mean that the study of inscriptions and coins found in association with specimens is used to determine their age, by comparison with written records. This method is not always reliable, and there are many difficulties. But broadly speaking it is the only way open for the dating of ruins and finds associated with them. Thus we know that the Vijayanagara, or Hampi, ruins in the Bellary district, and the Whispering Dome at Bijapur in Karnatak are of the fifteenth century, that the ancient university site of Nalanda in Bihar dates from the sixth to twelfth centuries, and that the site of Mahabalipuram near Madras, with its Pallava architecture, was built in the seventh century. Arikamedu, the Indo-Roman trading station near Pondicherry, dates from the first century A.D. (plate I). Of still earlier periods, I must mention the Asokan caves and pillars, which are as early as the third century B.C.

As we go back into the past, however, the historical evidence becomes increasingly vague, and finally ceases. It is very difficult for instance to say how old the megalithic monuments of southern India are, those burial structures made of huge rough stones (plate II). Recent research suggests that they may be as late as the first century B.C., but there are reasons to suspect that some are rather earlier, though probably not as early as similar structures in Europe which date from the beginning of the second millenium B.C.

At that time, and even earlier, about 2500 B.C., there existed in north-western India a city civilization which has aroused the

interest of the archaeological world. I am thinking of the Indus Valley civilization as evidenced by the sites of Harappa in the Punjab (plate III) and of Mohenjo Daro in Sind. These are the earliest archaeological remains in India to which the historical method of dating has been applied, as some of the objects found could be matched with similar ones in Mesopotamia, where the historical record extends back to about 3000 B.C.

No doubt one is entitled to expect that many more discoveries of such very ancient sites will be made in India. At the moment, a great gap exists in our record between the Indus Valley civilization and the third century B.C. It is one of the foremost problems of Indian archaeology to fill this gap.

The Indus Valley civilization is about 4500 years old. This may appear to be a very great age, but it is preceded by a very long period, measured in tens and hundreds of thousands of years, during which man did not know the use of the metals, had no agriculture, and was living as a mere food-gatherer. This is the Stone Age. With the Stone Age we are passing from the field of historical archaeology to the field of research called PREHISTORY.

At this point it is perhaps necessary to make it quite clear that the end of the prehistoric period in any area is defined by the earliest existing written records. In North America, for instance, everything prior to the arrival of Columbus in A.D. 1492 falls within the realm of prehistory. In Egypt and Mesopotamia, however, prehistory is concerned with periods prior to 3000 B.C. What about India? It appears that the Late Stone Age or Neolithic is represented in India by polished axes (plate IV). They may have lasted in places into the third century B.C. (Asoka's time), but very probably are mostly much earlier. This means, of course, that the Late Stone Age continued in some parts of India while city civilizations like that of the Indus Valley were flourishing. Such overlaps in time of different cultural stages are as frequent as they are difficult to establish.

Earlier than this Neolithic is the so-called Mesolithic, a period when man used very small, often minute chips of stone set in handles. These small stone implements are commonly called

microliths. Microliths have been found in many parts of India (plate V). What is their age? Again it is possible that microlithic cultures survived into comparatively recent times.

But some of them are likely to be older than anything we have discussed so far. This is suspected because in certain places microliths are found in bedded deposits of sand and silt, and a considerable period of time has to be assigned to the formation of these geological deposits.

It is here that geology comes into the picture. Preceding the microlithic period there are the phases of culture which we call the Old Stone Age or Palaeolithic. They are usually found in geological deposits often of great thickness, and the determination of their age is evidently a task for the geologist, who has made a special study of the mode of formation of river-gravels, silts, clays, beach-deposits, sand-dunes and so forth.

Moreover, such deposits often contain layers which were formed by the weathering of older layers. The products of weathering are well-known to us; we call them *soils* (plate XI); and not only the natural vegetation but also agriculture depend on the presence of soils. But there are many different kinds of soils, according to the climatic conditions under which they are forming. If, therefore, we find a buried soil in association with tools of early man, we can often establish that the climate in his time was different from the present one. Thus we learn that man has existed through long periods of time when the climate was not always the same as today.

Such evidence has indeed been found in India. There are the sites of the Sohan culture in the Punjab which have been correlated with phases of the Ice Age. There are others in Gujarat, in the Bombay area, and around Madras. Those near Madras (plate VI) are of historical interest, as tools were discovered as long ago as 1863, only four years after the fact, that similar specimens found in Europe were made by ancient man, had been recognized in England.

The dating of the Old Stone Age has so far been possible only in Europe. We now know that at least 500,000 years have elapsed

since its early phases. I do not wish to discuss the various methods employed in this dating work, but should say that they are all based on geological methods.

In all work on Stone Age Man, therefore, the prehistorian must co-operate with the geologist.

In concluding this brief talk I wish to draw attention to the fact that the important finds made in the Punjab, in Gujarat, the Bombay and Madras areas, and elsewhere, prove that man in India has a past as long as anywhere, and that it is highly desirable that Indian prehistory should receive more attention than it has had hitherto. The position of India between Europe and Africa on the one hand, and Australasia on the other, the two areas where important discoveries of Stone Age man have already been made, suggests that India is a kind of node where different trends of culture and routes of migration must have crossed each other. Great contributions to prehistory are bound to be made by India in the future, provided that a greater number of scholars than at present come forward and are equipped with the necessary facilities to carry on the good work.

II. EARLY MAN IN GUJARAT

ANNOUNCER:—'I understand, Professor Zeuner, that you have come to this country on an invitation of the Government of India in order to study the remains of prehistoric man. You have just returned from a tour of northern Gujarat, and I wonder if you would tell us something about your reasons for visiting that area.'

I will, with pleasure. But before I tell you what we have been doing in Gujarat, I should perhaps say that my work is not merely concerned with finds of prehistoric man and the tools which he used, but also with his conditions of life. Prehistoric man lived thousands, even hundreds of thousands of years ago, and it must not be assumed that the climate was then the same as to-day, nor were the type of vegetation and the animal-world.

'This is interesting. Does it mean that prehistoric man had a sort of food-supply different from that of modern man?'

Yes and no. Like modern man he, of course, depended on the environment, drawing his animal and vegetable-food from it. But whilst modern man is a food-producer (plate VIII), prehistoric man discovered the art of food-production very late, probably only about nine thousand years ago.

'Good Heavens, Professor, you call nine thousand years very late? To me it seems an enormously long period of time.'

That depends on the point of view. Strange to say, man had been living as a food-collector and hunter (plate VII) for at least half a million years before he found out how to cultivate plants and to domesticate animals. I should think, nine thousand years are not much more than a single jerk of the second-hand of the great clock which keeps the time of mankind. Personally, I am rather more interested in that remote period of human evolution, when man was using crudely-made stone implements, than in those late periods of agriculture and so forth. And this is precisely why I came to visit Gujarat.

'I see, can you explain this a little further?'

Well, Gujarat is one of those parts of India from which stone implements of very early man have been known for some time. They are mainly found on the banks of the River Sabarmati. The discoverer was BRUCE FOOTE, who, in the second half of the last century, wrote a book on the geology of Baroda State, in which he described some of his finds. These discoveries were somewhat neglected by prehistorians elsewhere, until Dr. SANKALIA, who is Professor of Proto-History in Poona, came to Gujarat to investigate the discoveries of FOOTE in detail; and now I have joined forces with Dr. SANKALIA and a number of other friends and colleagues in a joint expedition, in order to study the conditions of life of ancient man on the Sabarmati river and also to establish the period of time when those primitive Stone Age people were living in that part of the world.

'I hope that you are satisfied with your results.'

Indeed I am. We have been able to establish that, when our Stone Age ancestors were roaming about along the River Sabarmati, the climate of Gujarat was rather more humid than it is to-day. The rivers had already excavated their valleys to the depth at which they are now flowing, but we discovered that this period was followed by one of drier conditions. In fact, the deposits which we found on the banks of the Sabarmati have shown us that the climate became increasingly drier for some time and that the rivers were so filled with wind-blown dust that they raised their beds on the accumulating sandbanks. They were dry for most of the year, but when it did rain, they flooded the adjacent lands. After this period of dryness, we might almost say desert conditions, the climate again became wetter and forests once more covered the country. This period seems to have lasted for some time, but it, too, was followed by a period of dry conditions. Again, the Sabarmati and other rivers spread sand and fine gravel over the country-side. Wind began to play with the sand and dunes heaped up in many places. Thus, even today wind-blown sand deposits form the sub-soil of Gujarat.

The desert period was succeeded by a damper phase, when forests again spread over the country. The sands were thus caught

and fixed by vegetation. It was about that time that man of a much later cultural stage lived in this country. He made very small stone chips which were put together in wooden hafts to make compound implements like knives, sickles, spears and arrows. Remains of these people, both implements and the skeletons, were discovered and excavated at Langhnaj by Professor SANKALIA (plate V). The interesting feature of this period is that, while man was living there, the climate became drier once more and the sands were blown about. But this was a short interlude, after which the forests came again.

'So it appears to me that quite a number of climatic changes occurred since Old Stone Age man first came to the Sabarmati valley. Does this mean that he came a very long time ago?'

Of course, it does. It is precisely by means of these climatic periods which we observe in different countries that a chronology of early man is constructed. Such a chronology gives you the age of early man in terms of climatic periods.

'Hm. This is certainly a fascinating story, but I, as a layman, would much rather know the age of early man in years.'

I sympathize with you. The methods which give us the age of early man in years cannot yet be applied directly to Gujarat. All I can say is based on a comparison of the stone implements used by early man in the Sabarmati Valley with similar implements found in Europe and Africa. It suggests that Gujarat man is at least a quarter of a million years old.

But there is another point which I should like to raise. It is concerned with the final period of prehistory, when man began to practise agriculture. I have told you that, following the Langhnaj phase, vegetation covered the country and the movement of sand and dust was arrested. As in other parts of the world, the introduction of agriculture has destroyed the natural plant cover and the soil and it has exposed the old, fossil, wind deposits again. Now the winds are busy playing with their old material, and sand and dust have become a serious problem in Gujarat. What I want to say is that this condition is not due to the natural climate, but to the activity of man, and that it is not of the fore-

most duties to future generations of mankind to plan carefully, in order to arrest the movements of sand and dust by various methods, such as planting of trees, establishing a specially designed crop-rotation and above all, stopping that increasing menace to the fields of Gujarat, *nallah* erosion (plate X). You see that the study of prehistoric man is not purely a matter of historical interest. It tells us what happened in the past and thus teaches us what man ought to do in the present.

III. SOIL AND CLIMATE

Since I came to this country I have had the honour of addressing Indian listeners on two occasions. When the Indian Science Congress was meeting at Allahabad, I spoke about the close links that bind Archaeology and Prehistory to Geology. About a month ago, I told you something about the results of our prehistoric expedition in Gujarat where we found that since the days when man of the Old Stone Age was living in that part of India, the climate had oscillated repeatedly between a. humid one and a dry one. You may have asked yourselves how one could tell that this was so. The answer is that we found buried soils. This sounds strange enough, and I will therefore make an attempt to-day to explain to you what buried soils are and how they help us in recognizing the kind of climate that obtained at certain times in the past.

I wonder if you have ever considered the enormous importance of the process of soil-formation. The soil (plate XI) in which the plants grow, which produces all the food we derive from the vegetable-kingdom and which, indirectly, supports the animal-world also, is a disintegrated layer formed from the underlying rock. It is primarily the atmosphere which is responsible for soil-formation, for atmospheric circulation supplies rainfall. Rain wets the ground. Some of the water evaporates, some is taken up by the plants and the remainder slowly trickles through the ground until it reaches the water-table. This water on its way down dissolves certain substances in the rock and thus the process of weathering, or soil-formation, begins. As there is often enough dead and decaying vegetation present on the surface it is possible for some organic substances to become dissolved in the water—substances to which the term *humus* is applied—the water percolating the ground is not pure, but a very thin solution of these humus substances. Moreover, it always contains carbon dioxide which is a gas derived from the atmosphere. These impurities give the water acid qualities, and this is the reason why it is able to attack rocks as hard as granite or as tough as the Deccan trap.

The substances which are dissolved most readily are the alkalis, lime, soda and potash. That lime moves readily in the

soil will be known to most of you. I suppose you have all seen the kankar-nodules which are so common in many soils of India. Well, these are nothing but the lime which was dissolved in the process of weathering and subsequently deposited in the form of oddly-shaped concretions.

The three other important substances in the soil are silica, alumina and iron. Silica is best known in its crystallized form, in which it is called quartz. Many semi-precious gem-stones, like rock-crystal, amethyst and agate, consist mainly of quartz, and most sands and sandstones, as also those hard rocks known as quartzites, are made up chiefly of grains of quartz.

Then, there is alumina. This substance is the oxide of the metal, aluminium. It, too, is found in exceedingly large quantities in the crust of the earth. And finally, there is iron, more precisely its oxide mixed with water, a brown or reddish substance, which in everyday life is called rust. The red or brown colour of soils is mostly due to the presence of hydrated iron oxide.

The three substances, silica, alumina and iron, may behave in different ways in the forming soil. Silica and alumina, for instance, may join to form clay, that fine-grained matter which makes soils stick when it is wet. But in some soils, the alumina is removed by the water and with it goes the iron. Such soils become bleached and consist eventually of hardly anything but grains of quartz. In other soils, the silica is dissolved and alumina and iron remain. These soils are intensely red in colour. They are known as laterites. There are many other possibilities. The processes involved in soil-formation are very complex and a great deal of research remains to be done.

One point, however, is certain, namely, that the climate has a determining influence on the type of soil which is forming. In cool and temperate climates, for instance, alumina and iron are relatively more soluble than silica, whilst in hot climates, silica is, under certain conditions, dissolved at a faster rate, leaving a concentrate of alumina and iron in the soil. So you see that the climate of an area may express itself in the type of soil which develops on the surface of the land.

This brings us back to our original question, which was, how buried soils help us in recognizing the climate that obtained in the past. Once you have clearly understood that soil is the crust of disintegrated, 'weathered' material on the surface of the earth, it is easy to understand that, when the environment changes, the soil must change also. Or it may be destroyed by erosion, or else it may be covered by newly-forming deposits. Let us consider a few examples illustrating these three possibilities.

The first is that of a changing soil. Suppose you study an area which was originally covered with dense forests. Most parts of India were forested before man began to practise agriculture. Under such cover of dense vegetation a variety of soil types is developed which have one thing in common, that the dense vegetation protects them from excessive heating and drying up. Under such conditions, soluble substances like lime move downwards in the soil. They may accumulate in the deeper levels or reach the water-table and thus be removed altogether in solution. Now, suppose the climate changes to a drier one and the forest is replaced by steppe, thin scrub, or even patches of bare soil. Sometimes it is quite enough that man cuts down the forest and thus allows the soil to be exposed and to dry up. In either case, the downward movement of dissolved matter is retarded and, especially where the water-table is high, evaporation may bring it back to the upper horizons of the soils where it hardens, forming concretions or crusts. Lime or kankar crusts develop in this way in many places. Or else, taking a soil rich in iron, such as those commonly called laterites, the disappearance of the vegetation cover will lead to the formation of iron crusts. There are many other ways in which soils react to a change in climate, but those given must suffice. The expert is often able to deduce from the changes that have occurred in a soil the changes that have taken place in the climate.

The second case of changing conditions was that of the complete destruction of the soil. Streams or rivers may cut the soil away and thus remove it altogether. Even heavy rainwash can do this. Or, the wind blows the soil away. This means, of course, that the soil disappears from the scene and thus is lost to us as evidence for climatic conditions.

The third case, that of deposition of mud or sand or gravel on top of a soil, is from our point of view by far the most important. Suppose, for instance, a forested area, in which an ordinary red soil is forming, experiences a climatic change from humid to arid conditions. Rainfall would decrease, the forest disappear, and as the climate becomes drier and drier, bare patches on the ground will give the wind a chance to start its destructive work. Here, the old soil will be destroyed as I have pointed out before.

But in other places, the dust and sand removed by the wind will be deposited on top of our old red soil. So that the former forest-soil, the witness of a humid period, is covered by sediments like wind-blown sand or dust, witnesses of a period of dry climate. And the soil thus becomes a fossil, or buried, soil. Another possibility is that rivers cover soils with their deposits. Near the sea, soils have been found buried under muds which can only have formed beneath the level of the sea. They tell us a story of a rise of the sea-level, followed at a later stage by a drop to its present height.

I hope I have been able to show that buried soils are valuable evidence for the climate of the past, and this is why we have been searching for them in the course of our expedition. Soils are land-surfaces, and for this very reason the traces of prehistoric man, his tools, the remnants of his meals and sometimes even his own bones are found on them. The study of fossil soils, therefore, is an important method of reconstructing the prehistory of man.

I have told you on a previous occasion that we were able to deduce from the fossil soils found in Gujarat a long series of climatic fluctuations and to fit the stages of prehistoric man into this sequence (plate XII). Since then, our expedition has visited the Upper Godavari valley, the Bombay coast and parts of the Deccan. On the Deccan plateau we found that, on the whole, erosion and rainwash had done their work so thoroughly that soils and most deposits had disappeared. But this same process had brought about the concentration of tools of Stone Age man on the present land-surface and the shallow deposits left (plate IX). It is no exaggeration to say that in some places the surface of the ground is covered by thousands of stone implements.

We then visited south-east India, where valuable work has been done by MR. V. D. KRISHNASWAMI, of the Department of Archaeology and by DR. MANLEY, of the American Baptist Mission at Ramapatnam near Nellore. Here, and in areas round Madras, Tuticorin and Tinnevelly, we found many Stone Age sites associated with degraded and re-deposited soils of great scientific interest.

And finally, going north again, we came to Orissa where Messrs. N. BOSE and D. SEN of Calcutta University had made important discoveries in Mayurbhanj State. Here, to our delight, we found another buried soil, much of the same type as in Gujarat.

Thus, we are trying to combine the different trends of evidence for the climatic conditions under which Stone Age man was living in the west, the centre, the south and the east into a mosaic covering the whole of India. The north still remains to be studied.

IV. STONE AGE MAN IN INDIA

As our four months' prehistoric expedition has now come to an end, it is perhaps worth while to review some of the observations made and to point out the ways along which prehistoric research in India is likely to move in the future.

There is no doubt that man has existed in India for hundreds of thousands of years. There is abundant evidence for this. Stone implements have been found in large numbers, of a type which, in Europe, is known to have been made far back in the Ice Age. In India such tools have been obtained from river-deposits covered by 100 feet or more of gravels, sand and loams which were deposited by water and wind in the course of long geological periods. Although we are unable to date these tools in relation to the Ice Age at least so far as the Dominion of India is concerned, the work carried out by Dr. TERRA and PATERSON in Kashmir and Western Punjab has clearly shown that Stone Age man there was contemporary with the Ice Age of the Himalayas. This suggests that man in India goes back to a time when the climate was not the same as today. Moreover our studies, especially in Gujarat, have revealed a succession of phases of forest climate alternating with phases of a dry steppe climate, and all these phases proved to be later than the layers of gravel which contain stone implements in great abundance. It would be rash to assign a definite age in years to the latter witnesses of the earliest occupation of India by man; but comparing these stone tools, and also the climatic sequence with the finds made in Europe and Africa and the sequence of climatic phases in those countries, I think it is safe to say that the earliest known Indians are at least a quarter of a million years old.

At that time, however, man had reached a stage of technical evolution which cannot be regarded as primitive. Admittedly, he was making his tools mainly of stone, though he was probably using wood and bone also. But the tools which he produced were the products of skilled craftmanship and not simply fragments of stones. Man had already developed specialized techniques of giving to the implements exactly the shape which he required.

I will try to give you an approximate idea of what these tools were like. Suppose you take a river-pebble of an oblong shape and of a hard and even-grained material, for instance, a quartzite. You hold this pebble in your left hand and hit it near its tip with a hammer-stone held in your right hand. You will thus strike off a flake from the tip of your pebble, leaving a sharp cross-wise edge. A pebble prepared in this way was undoubtedly a useful tool for a man who had no other implements to cut with. Or, if you strike two flakes off the tip of your pebble, one on the left and one on the right, you obtain a sort of point, and you can use that pebble as a poker, or as a pick, or for piercing holes in the hides obtained from game-animals. Early man soon learnt to make more complicated tools than those just described, but, for a long time, the pebble tool predominated in his equipment (plate XIII).

Gradually, man learnt how to produce implements with long cutting edges all round, and with the surfaces of the tool chipped all over. When he arrived at this stage of technical evolution, he was able to make a tool which is well-known as the so-called hand-axe (plates VI and XIV). It is usually a pear-shaped tool, pointed at one end and round at the other, flattened and chipped over both its flat sides. There are many other varieties, oval ones, heart-shaped ones and so forth. In due course, man improved his method of making these tools by using hammers of bone or hard wood, instead of stone. This enabled him to make more beautifully-shaped implements and to produce straighter cutting-edges and to control the outline and size of the tool exactly in accordance with his requirements. The culture represented by these tools is well-known as the Acheulian phase of the Lower Palaeolithic (plate XIV), and Acheulian hand-axes are the most commonly found implements of Old Stone Age man, known from all parts of the Old World including India.

The types of tools which I have so far described were all made by chipping a lump of stone into the desired shape; but it must not be forgotten that the chips or flakes which come off in the process of making such 'core-tools' have, themselves, sharp cutting-edges and are, therefore, extremely useful. On many occasions in the past, man found it worth while to specialize in manufacturing flakes of

a suitable shape and to throw away the cores, so that we have, apart from the hand-axe or core-tool industries, other industries which used flakes almost exclusively. I suspect that those of our fore-runners who used the core tools were mainly collectors of vegetables, edible roots and the like and it is probable that they did not despise the many grubs and earthworms which they found when digging for their vegetable diet. Some of the flake industries on the other hand suggest that they were manufactured by people who were predominantly hunters and who made their tools for the purpose of cutting up game and preparing skins. Of course, we also find the two types of industries together, i.e., the core and the flake tools mixed, and the cultural pattern of Old Stone Age or Palaeolithic man is in reality a complicated thing.

It was only at a much later stage that man learned how to manufacture a new and more efficient cutting instrument in the form of a long narrow blade, much like the blades of our modern knives, only made of stone(plate XV, 1-3). These blade industries in all parts of the world followed the more ancient core and flake industries and they soon became extremely elaborate. The blades were not used as such only, they were chipped in certain ways and converted into points, engraving tools, arrow-heads and many other varieties. Some of them were set in handles or hafts into which they were stuck by means of resin. This group of industries is called the Upper Palaeolithic (plate XV).

In the course of time, man improved his technique of making these tools and he learned the art of composing long cutting-edges out of a large number of very small and very sharply-edged fragments of blades. This sounds tricky, but it is really quite simple. Imagine you break up a number of razor-blades into small fragments, and take a long piece of wood and cut a groove in it. Then you stick the razor-blade fragments into the groove all in a row, with their cutting-edges adjoining each other. When your resin or other glue has hardened you will have an excellent knife with a cutting edge far longer than that of the razor-blades. You see the idea. By using small individual pieces it became possible to make much larger compound implements of almost any desired shape, than has ever been possible in the Lower Palaeolithic, when tools were made of one piece only. But since the handles have perished

and only the little stone-chips remained, the evidence we find of these industries is of an inconspicuous type. The chips are mostly small and for this reason these industries are called microlithic (plate V).

From the microlithic phase, man passed on to the New Stone Age or Neolithic, when he learnt how to polish stones, to make pottery (plate XVI) and, more important than all these, how to till the soil. The New Stone Age was followed by the Metal Ages, first the Bronze Age and, in relatively recent times, the Iron Age.

It is now interesting to note what evidence we find in India for this technological evolution of man. First of all, the pebble tools are exceedingly common in the gravel-beds of Indian rivers: but whenever we found them, they were associated with hand-axes of the Acheulian type. Thus, although the pebble tools are technologically more primitive than hand-axes the association of the two types in India suggests that man here continued to make pebble tools at a time when he had already learnt the art of making Acheulian hand-axes. This is not so extraordinary as it might appear at first sight. In Africa, for instance, the same observation has been made in some places. It appears that where man had to rely on pebbles as raw material for his implements, he continued to make simple pebble tools for a very long time. Stone Age man was not a fool. He did not see why he should make elaborate implements, when simpler ones would do. So he continued making simple pebble tools alongside with the more complicated Acheulian hand-axes. So far as we can interpret the evidence from Gujerat, Dharwar, Bellary, Nellore, Madras, Mayurbhanj and Kota (in the area to be flooded by the new Rihand Dam), the main sites which we have studied, man had reached the Middle Acheulian stage of technological evolution when he made the implements which we find in such abundance in Indian river-gravels.

This Indian Acheulian culture with its pebble components deserves a careful study. It will have to be compared with corresponding African industries, and also with the sequence of Stone Age industries of Europe, where, however, the pebble tools are almost absent. This will be a big task for the prehistorians of India to undertake, for there is such a wealth of material that no

one man can ever cope with it, and more material is bound to be discovered in the future. At one site we had to hire a bullock-cart in order to take to our camp the implements collected within a single hour.

At the time when this Indian Acheulian was flourishing the country appears to have been relatively densely populated. At any rate this is the interpretation one is inclined to give to the abundance of implements found.

Before we had convinced ourselves that the pebble tools and the Acheulian hand-axes are contemporaneous, we thought that the pebble tools represented an earlier stage of human evolution. Now this appears not to be the case, and one naturally asks, where are the earlier stages to be found in India? This is one of the questions which has arisen out of our work and which will require the attention of Indian prehistorians.

There is another interesting point. I told you how the hand-axe and flake industries of the Lower Palaeolithic are succeeded, in other parts of the world, by blade industries of the Upper Palaeolithic type. Of such blade industries we know almost nothing from India. They may be present in caves in the Kurnool District, and Messrs. CAMMIADE and BURKITT have suspected their presence at the Nandi-Kanama Pass but almost everywhere else the next stage represented is the microlithic one. So here is another job to be done, namely, to look out for blade industries of the Upper Palaeolithic type, and to excavate caves which might contain them.

As I have mentioned, the microlithic stage is present in many parts of India. It is found in abundance especially in sandy districts and on the tops of riverside hills. The little artifacts are easy to find, for they were made mainly of quartz, or agate, or other white or conspicuously coloured stones. In India the microlithic phase lasted into the New Stone Age (plates IV, XVI) so far as we can see, but we found some geological evidence that at least part of it is considerably older than this.

To sum up. We have two conspicuous periods of Stone Age occupation in India, that of the Acheulian, and that of the microlithic. There is a gap between the two which requires investi-

gation, there is an undiscovered part of the story preceding the Acheulian, there is the question of the combination of pebble tools with hand-axes in the Acheulian, there is the scarcity of flake tools in India and finally the abundance of the microlithic.

All these are problems which might appear to the listener as unimportant details worthy to be discussed by bearded professors and of no further interest to mankind in general; but this is not so. All these stages of human technological evolution tell us something about the unfolding of the human brain. Intelligence is needed to make new discoveries. The story of the Stone Age reveals to us how slowly man's mind was working in the early days. Discoveries which led to the improvement of artifacts used in daily life were made but rarely, perhaps at intervals of thousands of years. In the Upper Palaeolithic the tempo of technological change became faster, and it quickened still further after that and increasingly so, until we arrive at the twentieth century with its complex technology and its multitude of new discoveries made in rapid succession. We thus learn that the tempo of technological evolution has become quicker and quicker.

Now this is a rather remarkable result, because the brain of man was much the same from the Upper Palaeolithic onwards. It was, and still is, the brain of *Homo sapiens*, the living species of man. The earlier industries may have been made by more primitive types of men, but at least for the later part of the story it is quite clear that it took *Homo sapiens* tens of thousands of years to learn and, so to speak, get the knack of technological advance. Whilst we might say that in the past man's physical evolution was ahead of his mental evolution, when discoveries were slowly and painfully made with long intervals between, it now looks as if we had acquired so much practice in making discoveries that the evolution of our brains is hardly able to keep pace with the discoveries. This seems to be the lesson we should learn from a comparison of Prehistory with the recently inaugurated, so-called, Atomic Age.

The problem of the technological evolution of man is intimately connected with the problem of his physical evolution. In other words, the study of the fossil remains of man is as important

as the study of his artifacts; but, alas, in India no fossil remains of Old Stone Age man have yet been found. I do not see why they should not occur. For a long time fossil man was known from Europe only. So everybody thought that man originated in Europe. Then Java man was found and it was presumed that man came from South-eastern Asia. In due course Africa took her turn. Most interesting discoveries were made there and it did not take long for the view to be put forward that Africa was the home of mankind. I believe that by now India's turn has come. What is really needed is that everybody concerned with work on deposits making up the surface of the earth, such as river-gravels, sands, and so on, should be on the look-out for such fossil human bones. This appeal goes mainly to geologists and archaeologists, but others, including amateurs, can help. There is no reason why India, so rich in the tools of early man, should not yield his bones also.

The urgent need is for more and well-trained workers in this interesting field of prehistory. It is a branch of fundamental research which provides the background for the understanding of the conditions of life of modern man. It is impossible to understand anything without knowing how it came to be. I therefore believe that man can derive much benefit from the study of his own past.

READING LIST

Readers who want to learn about Indian Prehistory are advised to consult regularly *Ancient India,* the excellently produced and well-illustrated serial of the Department of Archaeology, New Delhi.

The following articles and books will introduce the reader to the various branches of Indian Prehistory:—

Old Stone Age:—

V. KRISHNASWAMY, 'Stone Age India'. *Ancient India,* No. 3 (1947), pp. 11-49.

LAL, B. B., 'Exploration and Excavations, 1. Prehistoric and Protohistoric Period'. *Archaeology in India,* chapter II (Delhi, Ministry of Education Publ. No. 66, 1950).

Stone Age of Gujarat:—

H. D. SANKALIA, *Investigations into Prehistoric Archaeology of Gujarat* (Baroda, 1946).

F. E. ZEUNER, *Stone Age and Pleistocene Chronology in Gujerat.* Deccan College Monograph Series, No. 6 (Poona, 1950).

New Stone Age and Iron Age:—

R. E. M. WHEELER, 'Brahmagiri and Chandravalli 1947: Megalithic and other cultures in Mysore State'. *Ancient India,* No. 4 (1947-48), pp. 180-310.

B. SUBBARAO, *Stone Age Cultures of Bellary.* Deccan College Dissertation Series, No. 7 (Poona, 1948).

Chronology in General:—

F. E. ZEUNER, *Dating the Past.* 2nd Edition (London, 1950).

PLATE I. Examples of "Arretine" pottery (Figs. 1-6) and a fragment of a Roman lamp (Fig. 7) from Arikamedu, the Indo-Roman trading station near Pondicherry. They illustrate the historical method of dating.

"Arretine pottery" was made at Arezzo, Pozzuoli, and a few other places in Italy, where it can be closely dated. At Arikamedu three pieces have been found with the imprints of potters' stamps on them. One is VIBIE and refers to the Vibii or the Vibieni, two families of potters who worked at Arezzo from the beginning of the first century B. C. until after the middle of the first century A. D. Another stamp is that of Gaius Amurius, one of whose dishes was dated at the Claudian period (A.D. 41-54) at Hofheim, near Mainz, in Germany. These dates are, of course, known from written history.

The occurrence of these potsherds in Arikamedu is of great importance. First of all, they give us a date when the settlement was in existence and trade with the West flourishing. As Professor R. E. M. Wheeler has established, the settlement of Arikamedu continued after the importation of Arretine pottery had ceased. Since the production of this ware in Italy came to an end about the middle of the first century A.D., he suggests that A.D. 20-50 is probably the period when this pottery was used in Southeast India.

This date is, in turn, highly significant for Indian archaeology since the Roman pottery is at Arikamedu associated with local ware. Thus, it becomes possible to assign a definite date in years to certain types of Indian pottery whose age had hitherto been uncertain.

The Indo-Roman trading station of Arikamedu was described in detail by R. E. M. Wheeler in *Ancient India,* Vol. 2, 1946, and the plate is reproduced from the *Annual Report* of the London University Institute of Archaeology, 1947-48.

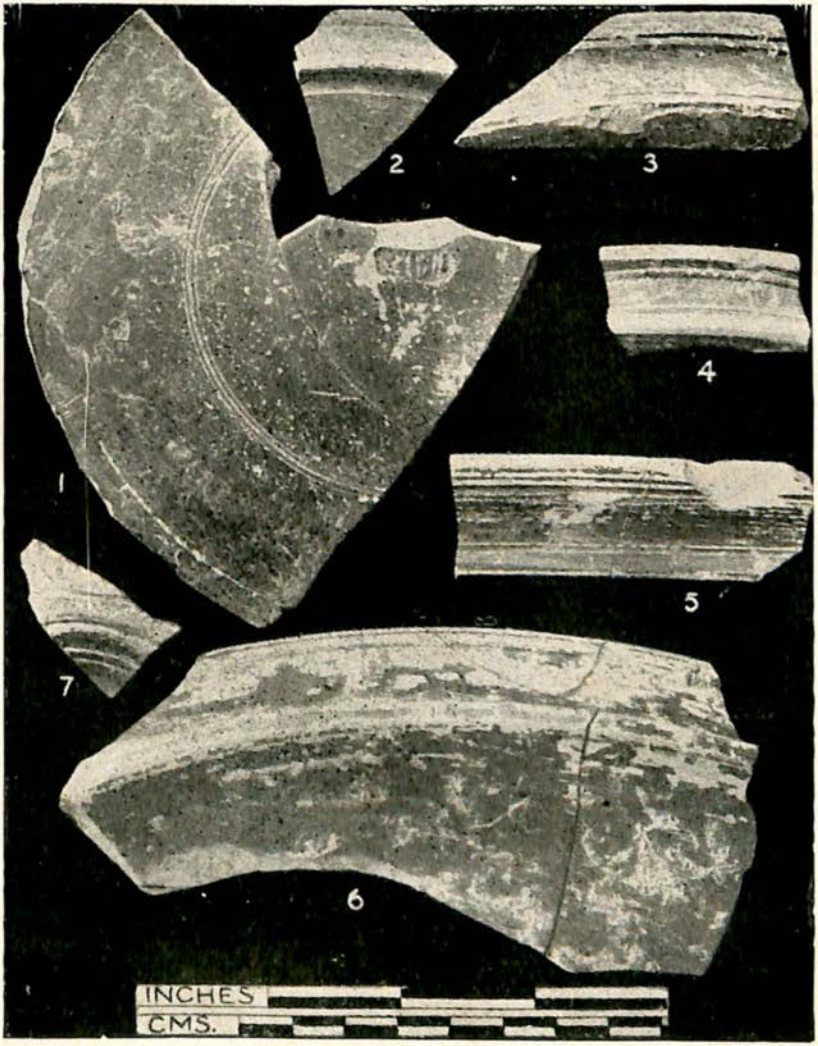

PLATE I.— 1—6, Arretine ware (I Stamped VIBIE):—7, fragment of Roman Lamp.

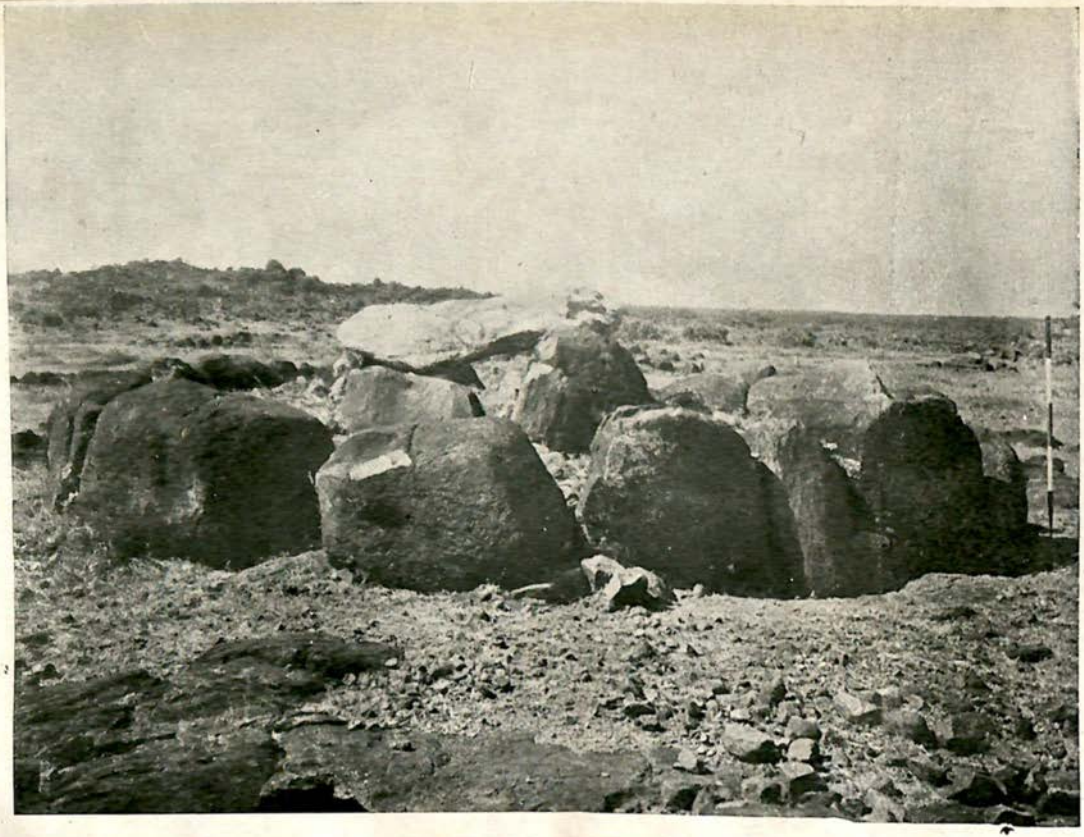

PLATE II:—Megalithic "cist" i.e. a burial chamber, from Kalanippakkam, Madurantakam Taluk Chingleput District.

PLATE II. Megalithic "cist", i.e. a burial chamber, from Kalanippakkam, Madurantakam Taluk, Chingleput District. The burial chamber proper is the structure in the middle, which carries a large cap-stone. The outer ring of stones marks the outline of a "barrow" or mound of earth which in all probability covered the stone structure originally. It has since disappeared, having been destroyed by the wind.

This is a small but well-preserved example. There are many larger ones in India.

Their period has been determined at Brahmagiri in Mysore (where the associated pottery mostly precedes the Andhra period) as ending in the last century B.C. after a life-time of about 3 centuries at this locality.

The photograph is from the Archaeological Survey of India, Southern Circle, Madras (No. 2062). A survey of Indian Megalithic monuments is being carried out by Mr. V. D. Krishnaswami. Preliminary discussions by Mr. K. R. Srinivasan, Professor V. G. Childe and Professor R. E. M. Wheeler are to be found in *Ancient India*, Nos. 1 and 4.

PLATE III. A Gateway with walls of the ancient city of Harappa in the Indus Valley.

This picture illustrates the "Indus Valley Civilisation" which flourished approximately from 2500 to 1500 B. C. At the same time it is a beautiful example of the art of archaeological excavation which Professor R. E. M. Wheeler, formerly Director General of Archaeology in India, has developed to perfection.

The structures marked "I" belong to the first period. A reconstruction was carried out in Period II, whilst the Gateway was eventually blocked in Period III.

From Professor R. E. M. Wheeler's report on the defenses of Harappa, published in *Ancient India*, No. 3, 1947 (plate 28).

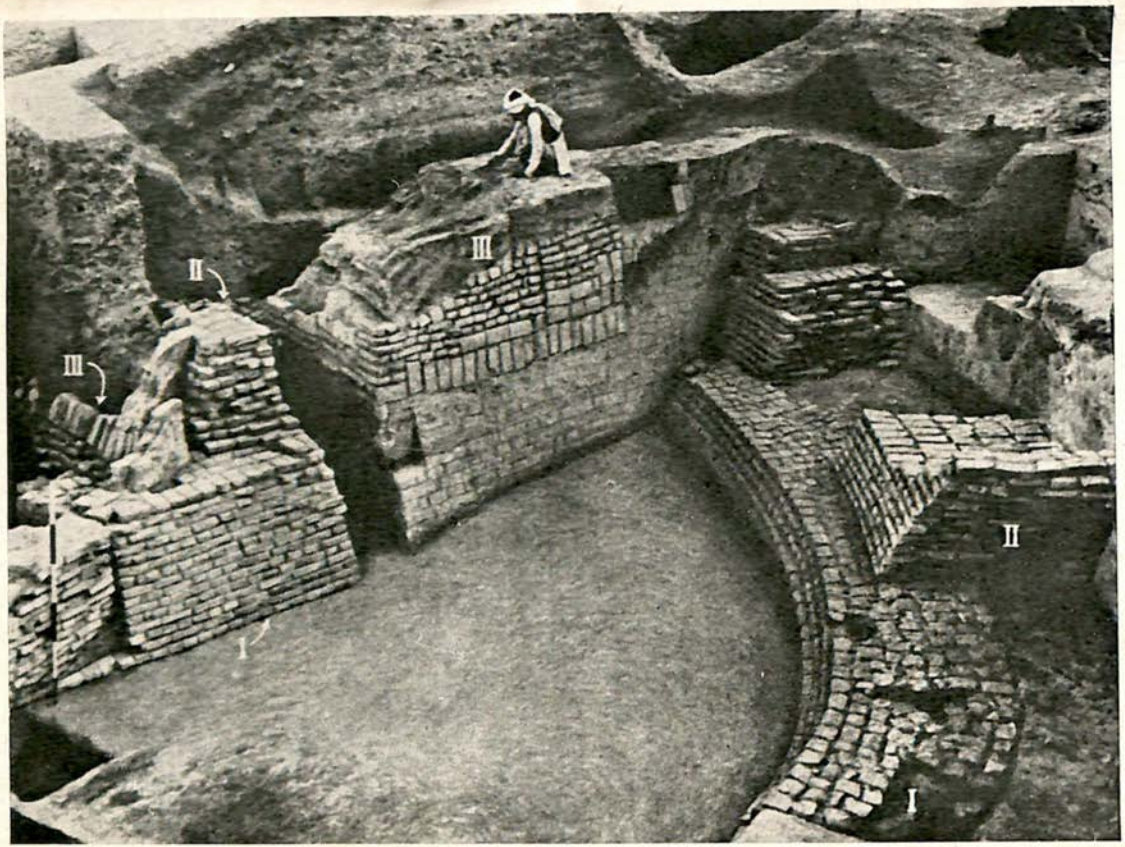

PLATE III:—Gateway C; Harappa Citadel

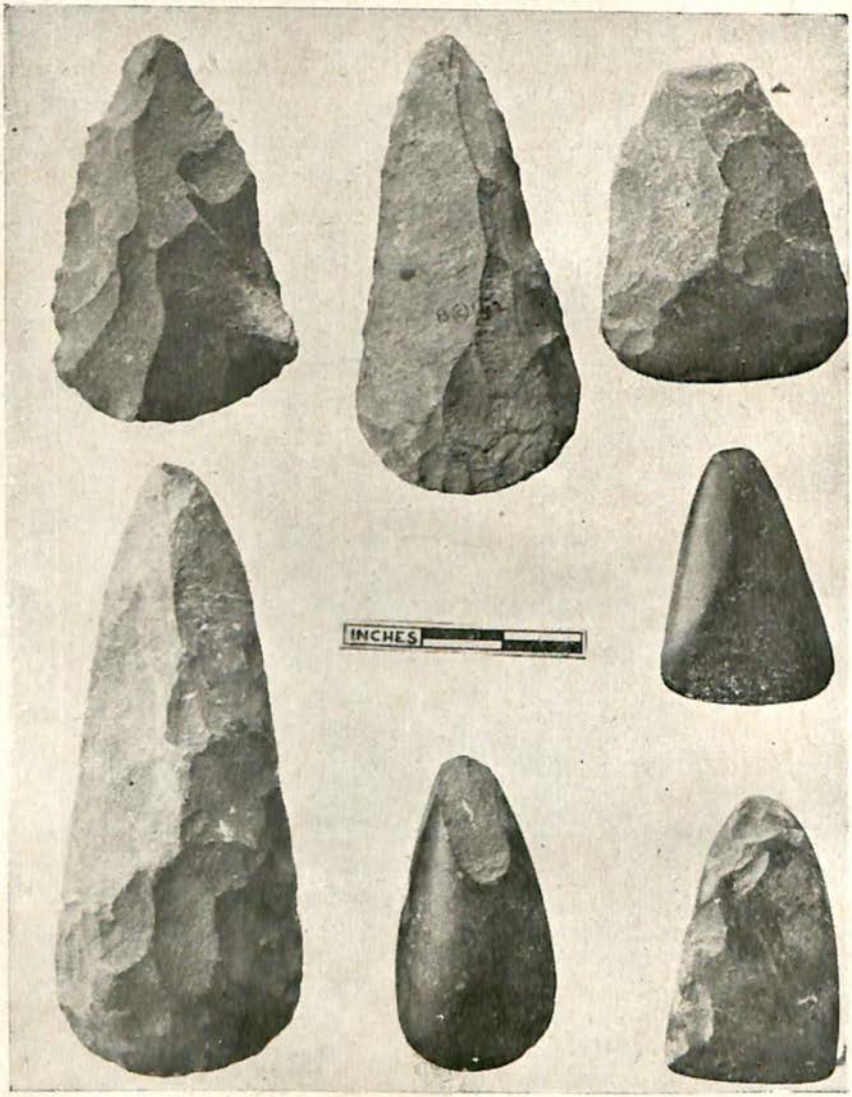

PLATE IV:—Neolithic Axes from Sanganakallu Hill near Bellary, excavated by Dr. B. Subbarao.

PLATE IV. Neolithic Axes from Sanganakallu Hill near Bellary, excavated by Dr. B. Subbarao.

The art of polishing stone implements was widely practised in the New Stone Age or Neolithic. The plate shows a number of "axes" or "celts" in various stages of manufacture. Note how closely the roughly-prepared first stage resembles a hand-axe of the Old Stone Age (or Palaeolithic). The cutting-edges are carefully prepared by flaking before the grinding process begins. Many, but not all, finished specimens are polished all over.

Photograph by courtesy of the Deccan College Research Institute, Poona. It shows some of Dr. Subbarao's material as published in the *Deccan College Dissertation Series*, 1948.

PLATE V. "Microliths" (small stone artifacts) from Langhnaj in northern Gujarat (Group 1), Hyderabad in the Deccan (Group 2) and Ellora in Aurangabad District (Group 3).

Before the period began when polished axes were made (plate IV) man had learned to make small and sharp stone artifacts which he stuck together with resin or pitch and which he fastened into hafts or handles. The tools have long decayed, but the small stone chips remained. They often litter the ground in places where prehistoric man lived. Here they are associated with innumerable "waste flakes" produced in the process of manufacturing the tools, and the cores from which the small flakes were struck are found also.

The plate shows such microliths from three different sites in India:—

(1) From Langhnaj in northern Gujarat, studied by Dr. H. D. Sankalia. Note the so-called crescents, with their straight cutting-edges and curved backs.

(2) From Adilabad, northern Hyderabad State. Note the two "cores" in the middle row. From these flakes were struck off which were given their intended shape by further "retouching."

(3) From Ellora, Aurangabad District. Several blades are shown which under a pocket lens prove to have been blunted along one of their edges.

The Ellora specimens were made from a milky chalcedony. Those from Hyderabad and Langhnaj are in cherts of various colours.

The photograph of the Langhnaj specimens was provided by the Deccan College Research Institute; those from Adilabad are surface finds made by Professor C. von Furer Haimendorf, and those from Ellora come from an old collection which Professor K. de B. Codrington put at the disposal of the London University Institute of Archaeology.

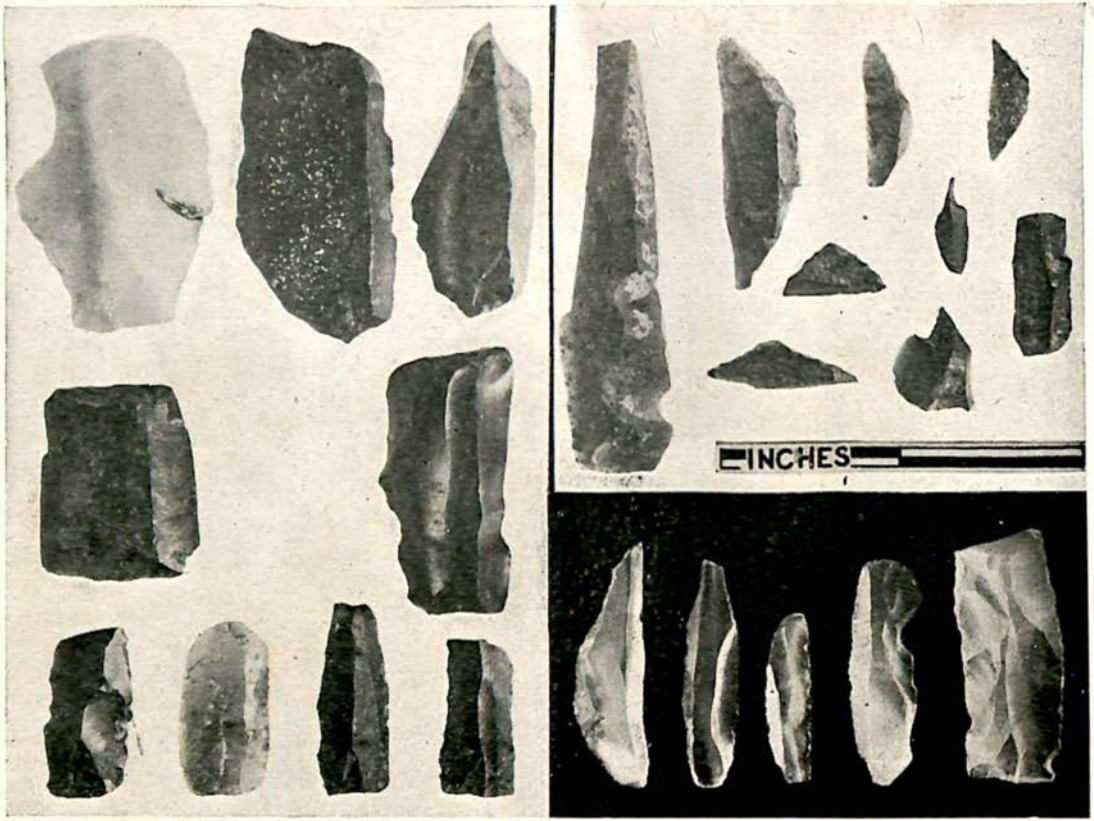

PLATE V:—Microliths (small stone artifacts) from Langhnaj in Northern Gujarat (Group 1) Hyderabad, Deccan, (Group 2) and Ellora in Aurangabad District. (Group 3).

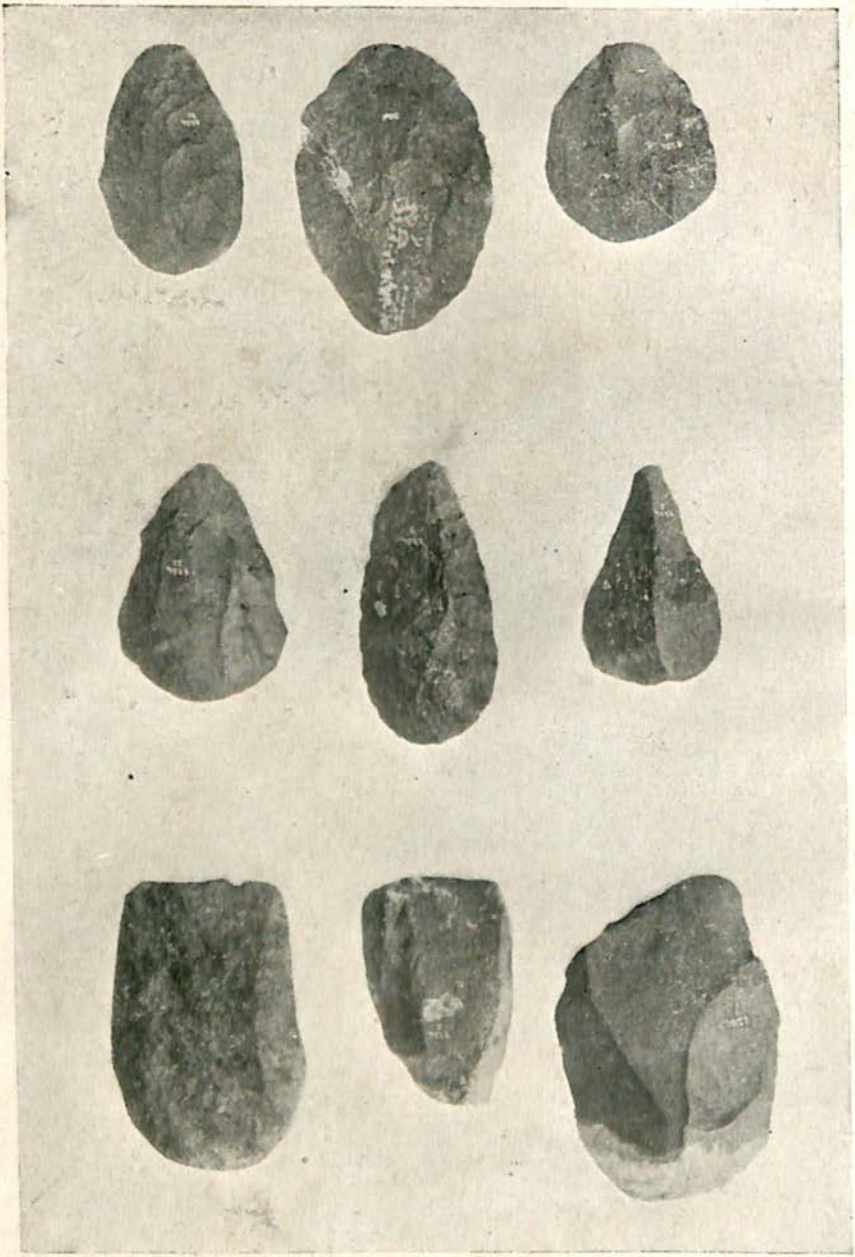

PLATE VI:—Nine implements from the Old Stone Age of India including the first finds, made in 1863.

PLATE VI. Nine implements from the Old Stone Age of India, including the first finds, made in 1863.

All these specimens belong to the "Acheulian" culture, which comprises three characteristic types shown in this plate. The first (top row) is the "cleaver", a tool with a straight cutting edge (which is sometimes oblique, specimen No. 1) and a rounded butt end to be held in the hand. They were possibly used for cutting and splitting wood. Cleavers are very common in India but, curiously, very rare in the Acheulian of Europe.

The second type is the "hand-axe" (second row). It is more or less sharply pointed at the working end, whilst the butt is rounded. This was probably a universal tool, and much used for digging up edible roots, grubs and other food. It is thus perhaps the fore-runner of the digging-stick (plate VII). It should be apparent from this, that the term "hand-axe", which is in common use, is a misnomer. Hand-axes are the most common Acheulian tools in Europe.

The third type is the "ovate". The only characteristic one shown is No. 8 (middle of bottom row); Nos. 7 and 9 are transitional to the hand-axe. Ovates are oval, flat, and have a sharp edge all round. What they were used for is not known.

The nine specimens shown here are from the collection of R. Bruce Foote, which is now in the Madras Museum. Nos. 1 and 2 are the first Stone Age tools ever found in India. Both were discovered in September 1863, by Dr. W. King and Mr. Bruce Foote respectively, in the Attirampakkam Nallah, Chingelput District, Madras Presidency. Nos. 5 and 7 come from the same place. No. 3 comes from the right bank of the Sabarmati River, opposite Sadolia in Baroda State. Nos. 6 and 9 are from Nellore, No. 4 from the North Arcot district, and No. 8 is an example from Mysore.

These specimens were first figured in the Catalogue of the Foote Collection. The photographs were kindly supplied by the Director of the Madras Government Museum.

PLATE VII. Two Chenchu women digging with digging-sticks for edible roots. Amrabad Hills, Hyderabad, Deccan.

This is an example of a "*food-gathering* economy" surviving into modern times. All food is obtained by hunting and collecting. Edible roots, for instance, are dug from the soil (as shown in the picture). The implement used is the digging-stick, here already made of iron, but originally of hardened wood. It is believed that one of the uses of the hand-axes of the Acheulian culture was to serve as a digging tool somewhat like a digging-stick. The surviving Chenchu tribes are, as Professor C. von Furer Haimendorf has shown, one of the few remnants of the primitive pre-agricultural food economy and thus of great anthropological interest.

The picture was first published in Professor C. von Furer Haimendorf's work, *The Chenchus* (London, 1943). He kindly lent the original negative for the present reproduction.

PLATE VII:—Two Chenchu Women digging with digging sticks for edible roots, Amrabad Hills, Hyderabad, Deccan.

PLATE VIII:—Four Hill Reddis dibbling millet on a forest clearing with their digging-sticks. Palonchon Taluk, Hyderabad, Deccan.

PLATE VIII. Four Hill Reddis dibbling millet on a forest clearing with their digging-sticks. Palonchon Taluk, Hyderabad, Deccan.

An example of a primitive stage of "*food-producing* economy". Cultivation is of the "shifting" type, *i.e.* the bush is destroyed (though the stumps are usually left in the soil) and the clearing used as a field for a period of years, until the soil is exhausted. A new plot is then prepared and the old one left to revert to forest.

The men in the picture are using long digging-sticks for cultivating. Here, the digging-stick has been adapted to a modified function. Though originally a food-gatherer's tool, it continues as part of the primitive agriculturalist's kit.

The picture was first published by Professor C. von Furer Haimendorf in his work, *The Reddis of the Bison Hills* (London, 1945). He kindly lent the original negative for the present reproduction.

PLATE IX. Section of river gravel resting on clay and covered with sand, in the bank of a small river, Nallavagu, near Peddagopavaram, Nellore District. At the point of the pick the expedition found an Acheulian implement. It is seen lying in the gravel.

This locality is typical of many in which Palaeolithic tools are found. The exposures are often much higher than the one shown. On the Sabarmati, for instance, the cliffs are as much as 100 feet high. But the situation is much the same. Implements are found mostly in the gravels, and less commonly in the fine-grained deposits.

It is of course much easier to find stone implements in the dry beds of present-day rivers, after they have been washed from the cliffs. In such places they often lie on the surface, ready to be picked up. But they might be of any age, either washed out from the bank and therefore as old as the gravel in the bank, or as late as the formation of the present river bed. Those found in the bank-section, *in situ*, as one says, are scientifically the more valuable, as they define the age of the industry relative to a particular geological deposit.

Expedition photograph (No. 25, 1948-49) by Archaeological Survey of India, Southern Circle, Madras.

PLATE IX:—Gravel Section with Stone implement on the west bank of Naleavagu, Peddagopavaram, Nellore District.

PLATE X:—Looking down into one of the numerous "Nallahs" on the right bank of the Sabarmati River, near Pedhamli, Northern Gujarat.

PLATE X. Looking down into one of the numerous "nallahs" on the right bank of the Sabarmati River, near Pedhamli, northern Gujarat.

A nallah is a temporary water-course, filled with water during the monsoon, dry for the remainder of the year, and deeply incised into the general level of the country. The old land surface is clearly seen in the distance. With each rainy season the many branches of the nallah continue to cut back into the old land surface and valuable agricultural land is destroyed. The small tributary-cuttings are shown in the picture.

The process of nallah erosion has been speeded up enormously, and is often caused by man. It starts with the destruction of the natural vegetation, cutting of trees and shrubs, and with the treading of footpaths and animal tracks. Once the process has begun, it can be halted only by counter-measures like the building of obstructions holding back water and soil, planting of certain types of protective vegetation and by avoidance of the causes of erosion. Nallah erosion is probably the most serious problem of agricultural India as it eats up the soil at a rate so fast that it is difficult for improvements to keep pace with it.

Prehistoric research suggests that the major part of this destructive process dates from after the introduction of crop cultivation and animal husbandry. The nallahs, regrettable though their presence is from the economic point of view, afford to the prehistorian and the geologist excellent cliff exposures in which they can study the formations of which the land is composed.

From a colour photograph taken during the expedition.

PLATE XI. The modern "soil" on beds of river gravel and sand in Balia Nallah near Hinauti, Rewah State.

Every prehistorian ought to be familar with the processes of soil formation. The picture shows, below the (rather scanty) vegetation on the top of the little cliff a darkened red, brown or black horizon about 3 feet thick. This is the soil proper. It was formed by the chemical action of percolating rain-water from sand and gravel which was quite fresh to begin with and just like the sand and gravel showing beneath the soil. This means that, first, the river laid down gravel and sand up to the top level; second, the river withdrew and, third, weathering began and worked its way down from the land-surface left behind by the river. The soil of course becomes thicker with age.

If a stone artefact is found in this type of soil, say about 2 feet down, it is not of the age of the soil formation, but of the age of the river sand and gravel, since soil formation is a destructive process which has followed the building up of the sand and gravel beds. This example illustrates how knowledge of the processes which alter the earth's surface and the study of which is called "physical geology" help in the placing of prehistoric cultures within a sequence of geological events.

Expedition photograph (No. 9, 1949-50, Archaeological Survey of India, Southern Circle, Madras).

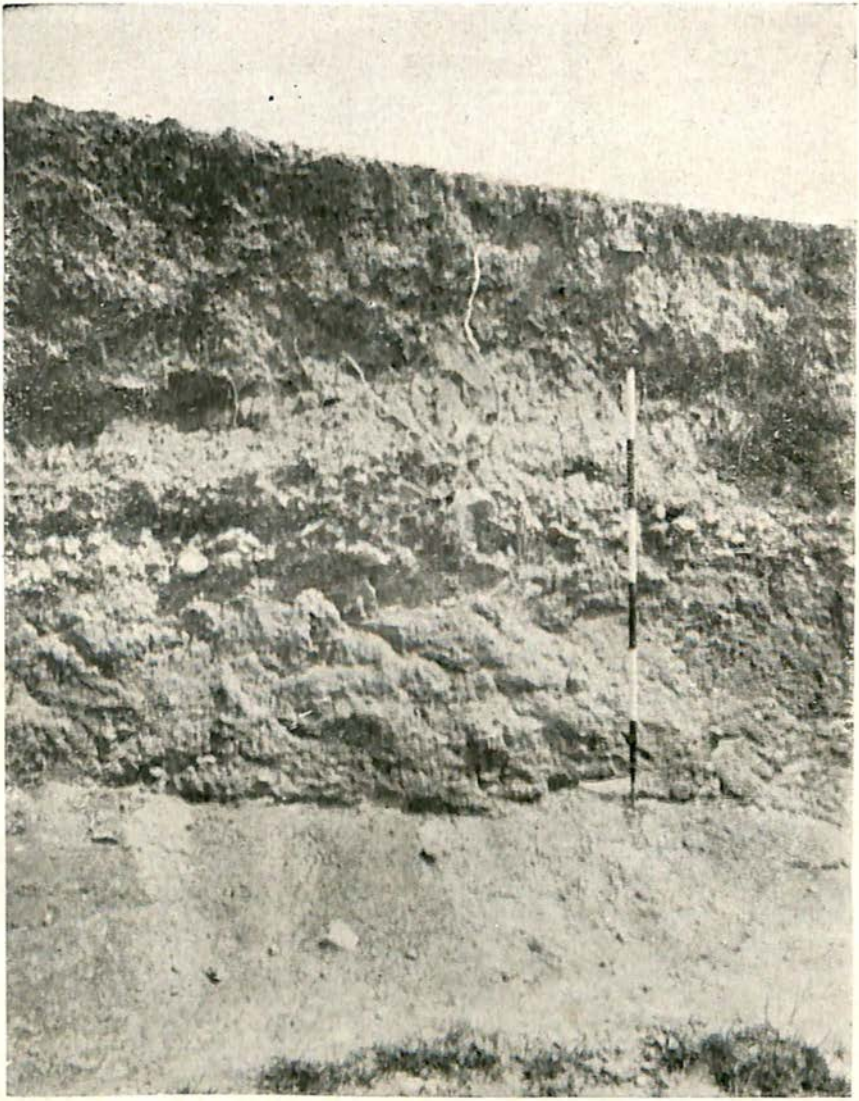

PLATE XI:—The modern "soil" on beds of river gravel and Sand in Balia Nallah near Hinanti, Rewah State.

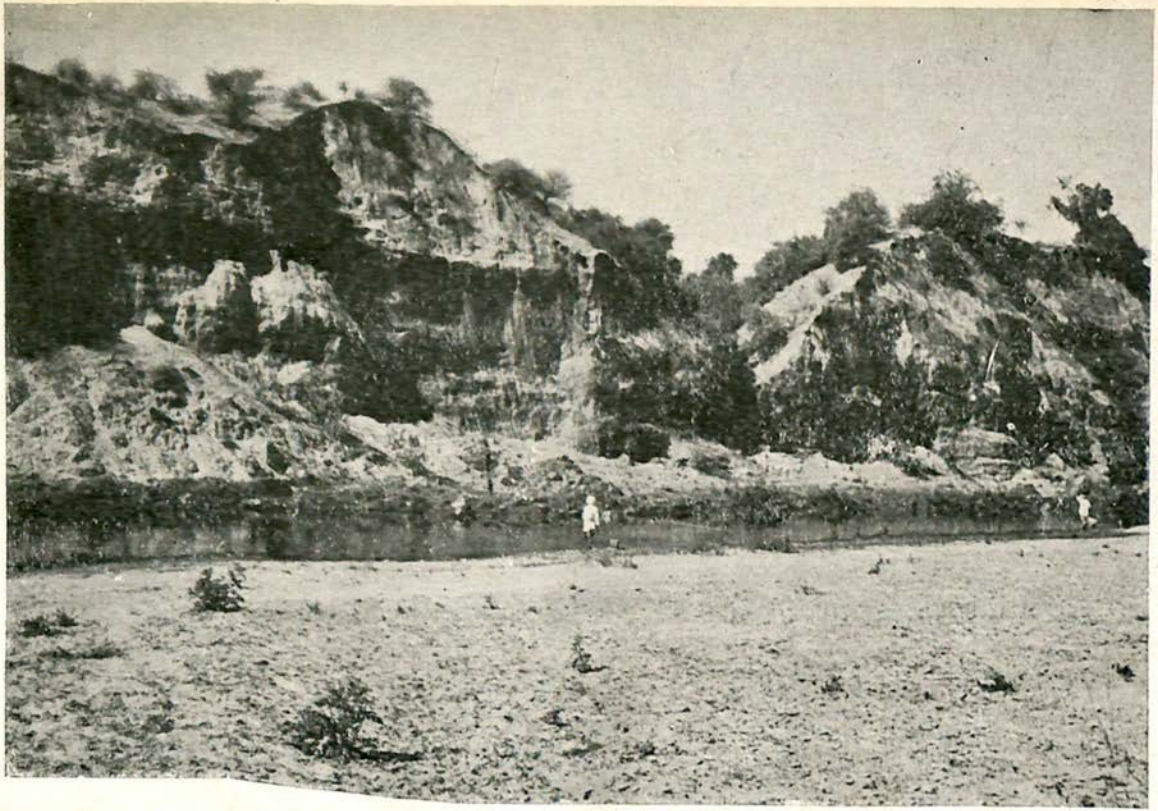

PLATE XII:—The cliff of the Sabarmati River near Juna Hadol, Northern Gujarat, showing a buried land surface.

PLATE XII. The cliff of the Sabarmati River near Juna Hadol, northern Gujarat, showing a buried land surface.

The lower portion of the cliff consists of gravels and sands laid down by the river a long time ago. The Sabarmati was then raising its bed to a level much above the present-day one. During this period Acheulian man was living in Gujarat; his stone tools have been found both in the gravel and the sand. At the end of this period the river ceased to shed more sand, vegetation began to cover the sand flats, and as the result of weathering processes (see plate XI), a reddish soil was formed. This soil is clearly visible as a dark line about half-way up the cliff.

Subsequently, however, the climate became drier, and more sand was deposited, this time mostly by wind, covering the old land surface with its red soil. The soil thus was *buried* beneath younger deposits, and chemical processes stopped in it. This is why such formations are called "fossil" or "buried" soils.

Expedition photograph.

PLATE XIII. Four "pebble tools" (obverse and reverse) from the Old Stone Age (Palaeolithic) of Giddalur, Kurnool District.

Pebble tools were among the first which man made. Notice the simple way in which cutting edges or points are produced by means of a few blows. Much of the original pebble surface has been left untouched. Compare these with the Acheulian tools shown on plate VI, and you will see how much more "advanced" they are.

In many countries, notably in tropical Africa, pebble tools are the earliest in order of appearance. But man continued to make these simple types long after he had learned to make the more elaborate Acheulian tools. The Acheulian of India contains many pebble tools. This shows that Stone Age Man was intelligent enough not to waste his energies: he did not make the complicated tools when suitable raw material was scarce and simpler tools would serve just as well.

Naturally, pebble tools are most frequent near the rivers where the raw material occurs. Masses of them have been found in Gujarat and Madras Province, but those figured were recovered by our expedition near Giddalur, in the interior of the Peninsula.

Photograph (No. 11, 1949-50) by Archaeological Survey of India, Southern Circle, Madras.

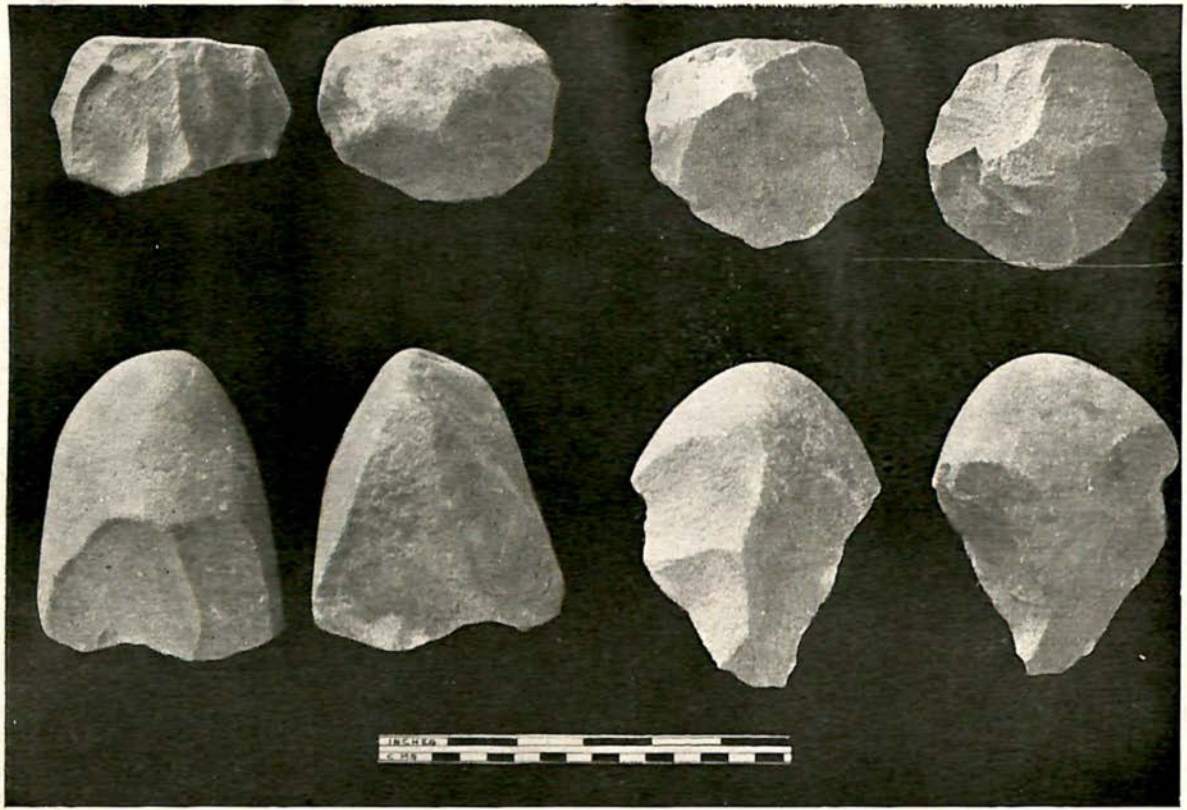

PLATE XIII:—Four "pebble tools" (obserse and reverse) from the Old Stone Age (Palaeolithic) of Giddalur, Kurnool District.

PLATE XIV:—Three examples of "hand axes," the most characteristic and most widely-known tools of Old Stone Age.

PLATE XIV. Three examples of "hand-axes", the most characteristic and most widely-known tools of the Old Stone Age.

The first is the most primitive type which is crudely shaped but little superior to a pointed pebble-tool; it is called "Chellian" or "Abbevillian" from characteristic sites in France. The specimen shown, however, is of African origin; it comes from Northern Rhodesia. The hand-axe cultures experienced a conspicuous development in East and South Africa.

The second is the characteristic "Acheulian" hand-axe, with its carefully finished cutting edges. The specimen shown comes from a fossil beach deposit near Arundel in the south of England, but Acheulian hand-axes occur in enormous quantities in many parts of India, for instance, in Madras Province.

The third is an example of the final phase of the Acheulian culture, the so-called "Micoquian". Its shape is peculiar, there is a thick butt for gripping, and the point has become thin and long, almost knife-like. It is the latest of the three types. The specimen comes from France.

Specimens from the Lower Palaeolithic Collection of the Institute of Archaeology, London University.

PLATE XV. Some Late Old Stone Age artefacts from Western Asia: "Upper Palaeolithic" tools from Palestine.

The Upper Palaeolithic phase of the Old Stone Age is particularly well developed in Europe. It is known to have extended as far as Palestine, Anatolia and Kurdistan, but whether it ever extended into India is a problem which awaits investigation.

The specimens shown on this plate illustrate different types of tools. Figs. 1, 2 and 3 are cutting tools comparable with knives. Figs. 4, 5 and 6 are scraping tools such as are needed to remove flesh, fat and other tissue from the underside of animal skins to be used as clothing. Fig. 7 is a special type of scraper with a nose-like extension which may have served in the making or cleaning of grooves. Figs. 8 and 9 show "burins", etching or engraving tools with a strong and sharp, though short, working edge. They were used extensively for the cutting of bone and antler, two raw materials which played a great part in the economy of Upper Palaeolithic man. Finally, Fig. 12 shows one of the "cores" of chert from which knife-blades like Figs. 1-3 have been struck.

Reproduced from Dr. R. Neuville's paper on the Prehistory of Palestine published in the *Revue Biblique,* April 1934.

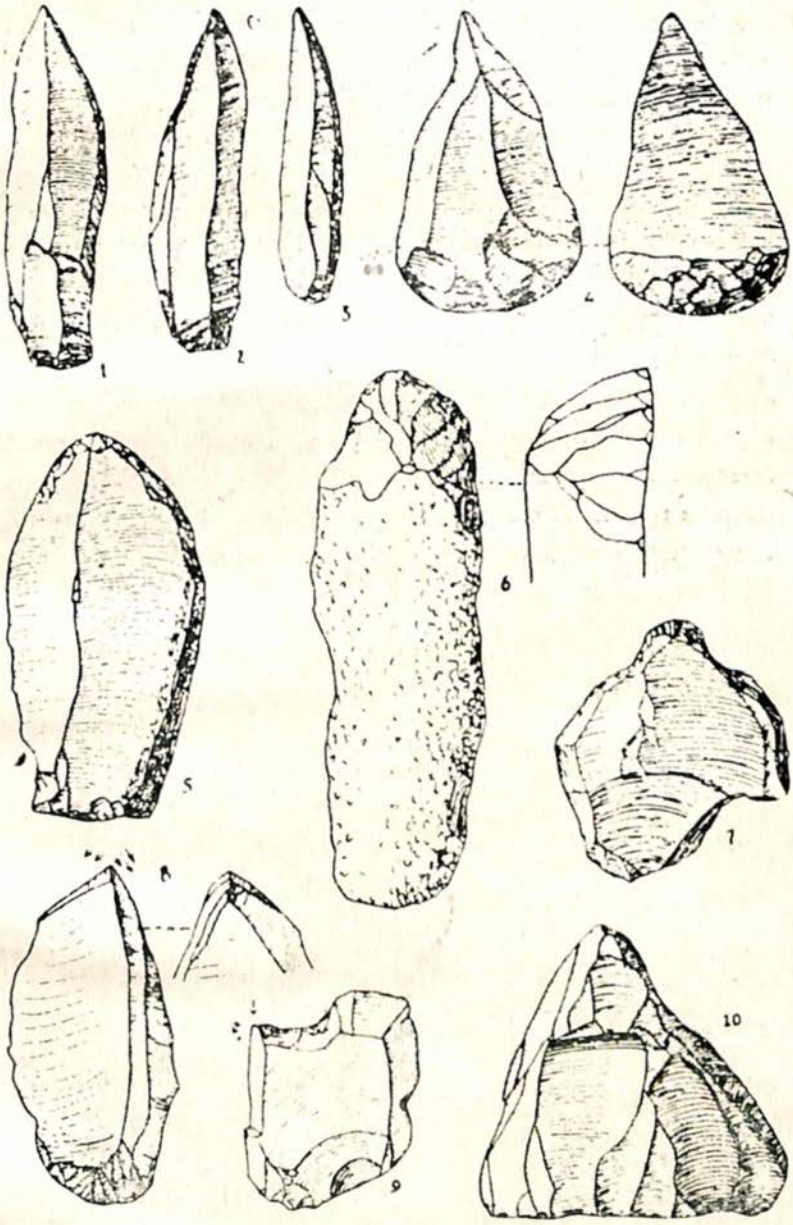

PLATE XV:—Some Late Old Stone Age artefacts from Western Asia, "Upper Palaeolithic" tools from Palestine.

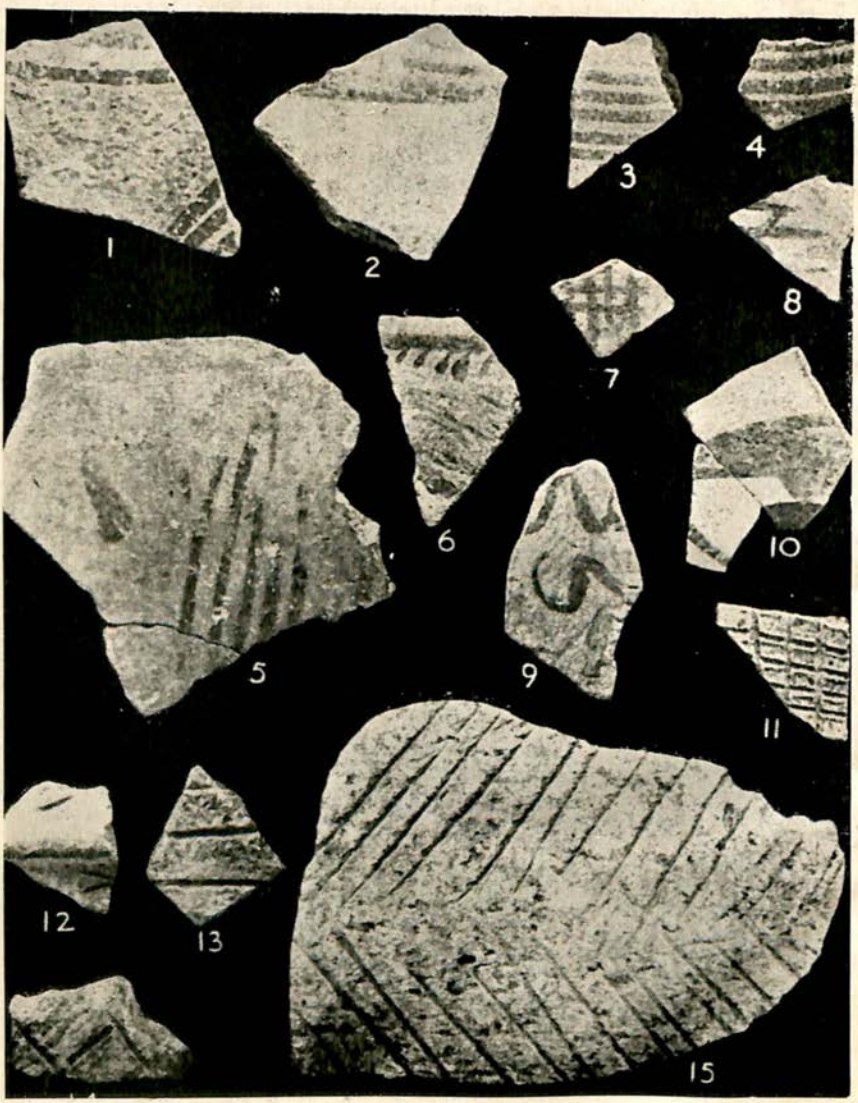

PLATE XVI:—Painted and Incised Pottery of the Stone Age Culture; Brahmagiri.

PLATE XVI. Painted and incised potsherds of the "Stone Axe" Culture of Brahmagiri, Mysore State. These sherds are prehistoric, and older than the Megalithic culture (see plate II). They are contemporary with polished stone axes of the kind figured on Plate IV from a site near Bellary and may, therefore, be called Neolithic. Unlike the later, e.g. Megalithic, pots, these were all hand-(not wheel) made. The fabric is coarse and grey, though some of them are polished. A very common type of vessel is a round bottomed pot with a plain, slightly everted rim. The decoration was applied after the firing of the pot, and the pigment used was brownish-purple ochre (hematite). The pattern is difficult to judge from the fragments known, there are straight lines, criss-cross lines, wavy lines and herring-bone patterns.

Excavated, described and figured by Professor R. E. M. Wheeler, *Ancient India,* No. 4, 1948.

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